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ABSTRACT

This speech reviews some major problems in public construction and focuses on ideas to make the construction process shorter, smoother, and more economical. Construction delays occur in (1) program development -- the initial phase of the project in which owners' needs are sorted out; (2) production of design and construction documents that require approval of various public reviewing agencies; (3) funding; and (4) poor or no management. Poor construction management is considered the major contributor to project time problems. To provide a continuity of project management, the position of construction manager -- a professional level job for a person skilled in all phases of construction who would represent the owners' interests -- is proposed. The functions of this position are outlined, and a graph and three flowcharts illustrate the presentation. (MLF)

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MANAGEMENT OF TIME, COST AND QUALITY IN PUBLIC CONSTRUCTION TODAY

(An Idea Whose Time Has Come)

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MANAGEMENT OF TIME, COST AND QUALITY IN PUBLIC CONSTRUCTION TODAY

by

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Anyone recently involved with a building project must realize that there are many and difficult problems in construction. I'd like to review with you some of the major problems and focus on some ideas that in my opinion can make the entire process shorter, smoother, and more economical. Let me say also that the ideas presented here are not original with me. Most of these ideas have been utilized in one way or another but unfortunately they are not generally understood nor implemented in practical procedures.

The high cost of building today is an accepted fact everywhere. Recent headlines concerning this situation read:

> "The Skyrocketing Cost of New Construction"...."College Building: What's Forcing the Price Up?"...."Construction Outlook is Grim - Priced Out of Market"...."Tight Money Slows Building - Costs Rise 1% Per Month."

In the Detroit Area, which is my home base, school building costs have almost doubled in the past 10 years or so. Secondary schools that cost $15.00 to $17.00 per square foot in 1960 are now costing $28.00 to $34.00 per square foot in Michigan. Recent additions to secondary schools in the City of Detroit ranged from $32.00 to $34.00 per square foot. Comprehensive high schools are ranging from $32.00 to $37.00 per square foot.

College classroom buildings are costing $34.00 to $45.00 per square foot in Michigan today and laboratory buildings cost even more. For most of us, these costs are pretty hard to adjust to.

In our office, we are forecasting future construction costs rising at a 10 percent annual rate and advising our clients to budget accordingly. We see construction costs continuing to rise at about 1 percent per month. With this sort of condition, time becomes a very crucial factor -- perhaps our most important factor. It's necessay for us to consider the qualitative aspect of time. In other words, it's not so much how much time you have but what you do with it that really counts! The qualitative factor becomes more important than the quantitative factor.

Obviously, our projects are taking longer to construct. The School Housing Division of the Detroit Board of Education told me recently that project completion time had increased about 50-70 percent in the past 10 years. Just how typical this may be I don't know, but certainly construction projects everywhere are encountering more delays. (See Chart I).

Let's consider the items that require the major time spans on a typical project. What are the delays? What are the causes of the delays? What opportunities are there for time savings?

Let's take as an example a typical $5,000,000 college classroom building with total estimated completion time of 160 weeks from beginning of program (See Chart II).

Program development has been allocated four weeks as a full time task, but we all know that often this phase of the project can drag out for four months. This is the initial phase of the project in which the owners' wants and needs are sorted

out in detail. The culmination of this process is a comprehensive statement of the initial and long range building requirements including a listing of all functions, relationships, individual spaces, etc. I worked on one project that was 10 months in program development. I think we must all recognize that intensive effort is necessary to accomplish this task in four weeks but it can and should be done if the time schedule is urgent.

Let's also recognize that programing is a skill in itself requiring an objectivity with skilled procedures and techniques to get all the essential information in minimal time. Let's recognize also the necessity for completing the basic programing before the architectural designer is exposed to the program. The educational staff needs careful guidance and leadership to assure development of a program that is based on practical needs rather than on personal wants.

Certainly there is an opportunity in this phase to pick up some time by concentrating on the general, basic information first so that the architect can begin work on the general, over-all building while detailed programing is going on.

Production of design and construction documents accounts for about one-third of the total time -- certainly a major segment. Over the years we have seen this expand a bit and one of the principal reasons for this increase is the required approval of the various public reviewing agencies. For instance, we find approval by the state fire marshal alone may require 8-10 weeks, during which time much work cannot proceed without risk of expensive correction.

Other agencies involved are state and local building authority, health department, electrical code authority, plumbing code authority, department of education and possibly some federal agencies.

Funding for college and university projects is often the cause of delays. We've had as many as three federal agencies participating in the funding of a project, and therefore the reviewing and approval of it -- each one with its own criteria, its own forms to be completed and an unwillingness to accept data or documents prepared on forms of any other agency.

Granting of money for programing, planning and design is often made without a commitment for actual construction. Often a year or more will elapse between the preliminary funding and the final funding. For a $5,000,000 project, with our present rate of inflation, this year of delay probably means an additional $500,000.

During the construction process we usually encounter one delay after another. We are accustomed to delays due to labor disputes, bad weather and accidents, but many of the delays appear due to poor management or lack of management.

In my opinion, proper construction management may be the essential key to solving most of our time problems all the way through the project. The construction team, as many of them function today, is inept, inefficient and inadequate for the complex building task. The construction team is usually three, four or five prime contractors, but we've had as many as 12 on one project, each with a separate construction responsibility.

Commonly, the construction is bid and awarded to contractors separately for the architectural trades, mechanical work, electrical work and one or more equipment categories. These contractors probably never have worked together as a team and the chances are they may never want to again! They will likely

be involved in constant bickering and blaming each other all the way through. These are the lowest responsible bidders who are typically awarded the construction contracts on most public projects today.

What happened to the general contractor and why isn't there just one contract for all work as there used to be? Well, the general contractor is still around and some public work is still bid and awarded as one contract, but the old general contractor is pretty much of an anachronism. In the past 25 years, the trend in public work has been to bid and award in separate contracts. As far as I can tell, this practice of separating contracts began in the interest of saving money, but I have yet to see that it has resulted in anything but greater costs, increased time and more quality control problems!

Several methods have been tried to unify the separate contractors into a working team through some kind of management agreement, but these methods have met with varying degrees of failure. Without responsibility and authority in one central control, effective management is impossible -- yet effective management is absolutely essential for proper control of the project.

Business and industry have used <u>construction management</u> in various ways as desired to effectively plan and build office buildings, shopping centers, large industrial complexes, etc., and achieved control of these projects from planning through to occupancy -- and even into operation and maintenance if desired. During World War II some of the large defense plants were constructed on a similar basis to meet a crisis situation.

This kind of management, in my opinion, should also be utilized in public construction today.

The essential key to effective management is the construction manager, a professional skilled in all phases of construction who represents only one interest -- the interest of the owners of the project. Some owners with adequate experienced management and staff capability may be able to provide their own continuous construction management.

The construction manager can be selected to render a professional service throughout the duration of the project (See Chart III). As a construction expert, he can perform such functions as:

1. Assist in budget determination if desired.
2. Assist in site selection.
3. Work with the architect in the planning and development of the design and construction documents, participate in determination of systems, materials, construction methods for budget compliance and general practicality.
4. Advertise and bid various categories of construction as may be appropriate (but not act as general contractor), such as:
   a) Site grading and landscaping.
   b) Footings, foundations and utility work.
   c) Structure and exterior skin.
   d) Mechanical work (plumbing, heating, and ventilating).
   e) Electrical work.
   f) Elevators.
   g) Interior finish (walls, ceilings, floors, etc.).
   h) Equipment and furnishings.

5. Evaluate bids with architect and recommend for award of contract by owner.

6. Manage the construction project and work jointly with architect and owner in any modifications which may be required during construction for maintenance of quality, time schedule, and budget compliance.

   a) Schedule and expedite all work, including that of owner, architect, construction manager and all trades, on Critical Path Method, PERT, or similar schedule.

   b) Process all pay requests.

   c) Review and approve all shop drawings.

   d) Administer and supervise all construction at the site.

   e) Work with architect on development of punch lists.

   f) Organize and facilitate final approvals, claims, guarantees, waivers, etc.

   g) Lay out the building.

   h) Provide cleanup, temporary utilities and services as required.

In effect, then, the construction manager provides a continuity of management all the way through. As a professional he is paid a fee for his work. The owner, architect and construction manager work together in close collaboration from start to final closeout.

In summary, the following advantages are possible through construction management:

1. Expert construction judgement and experience, and accurate cost estimating at the beginning.
2. Continuity of construction planning and execution; eliminating gap between planning and construction.
3. Top quality management for the construction phase instead of relying on the low bidder's ability.
4. Effective construction cost control, continuous estimating and review (constant feedback). Taking advantage of market conditions for the most favorable bidding time for specific trades.
5. Expediting project completion and reducing total time required (See Chart IV):
   a) Fast start on early construction work.
   b) Phasing the construction and overlapping the work.
   c) Permitting <u>more</u> time for certain phases, such as:
      - Programing
      - Design
      - Construction documents
      - Some phases of construction work.

In summary, the construction manager can provide a continuity of management that will enable a doubling up and overlapping of work at various phases. This and other time savings should amount to 20 percent over the old method.

But if an enthusiasm and sense of real urgency are generated and if the right incentive and motivation are provided, an additional 10 percent may be generated.

Consequently, total savings of 30 percent appear possible. This means 30 percent savings on a 160-week schedule, which equals 48 weeks. Combine this with an inflation rate of 1 percent per month, and we have total savings of approximately 10 percent, or $500,000, on that $5,000,000 project.

So here is a method of saving money and time in public construction with probable increased quality control as a bonus!

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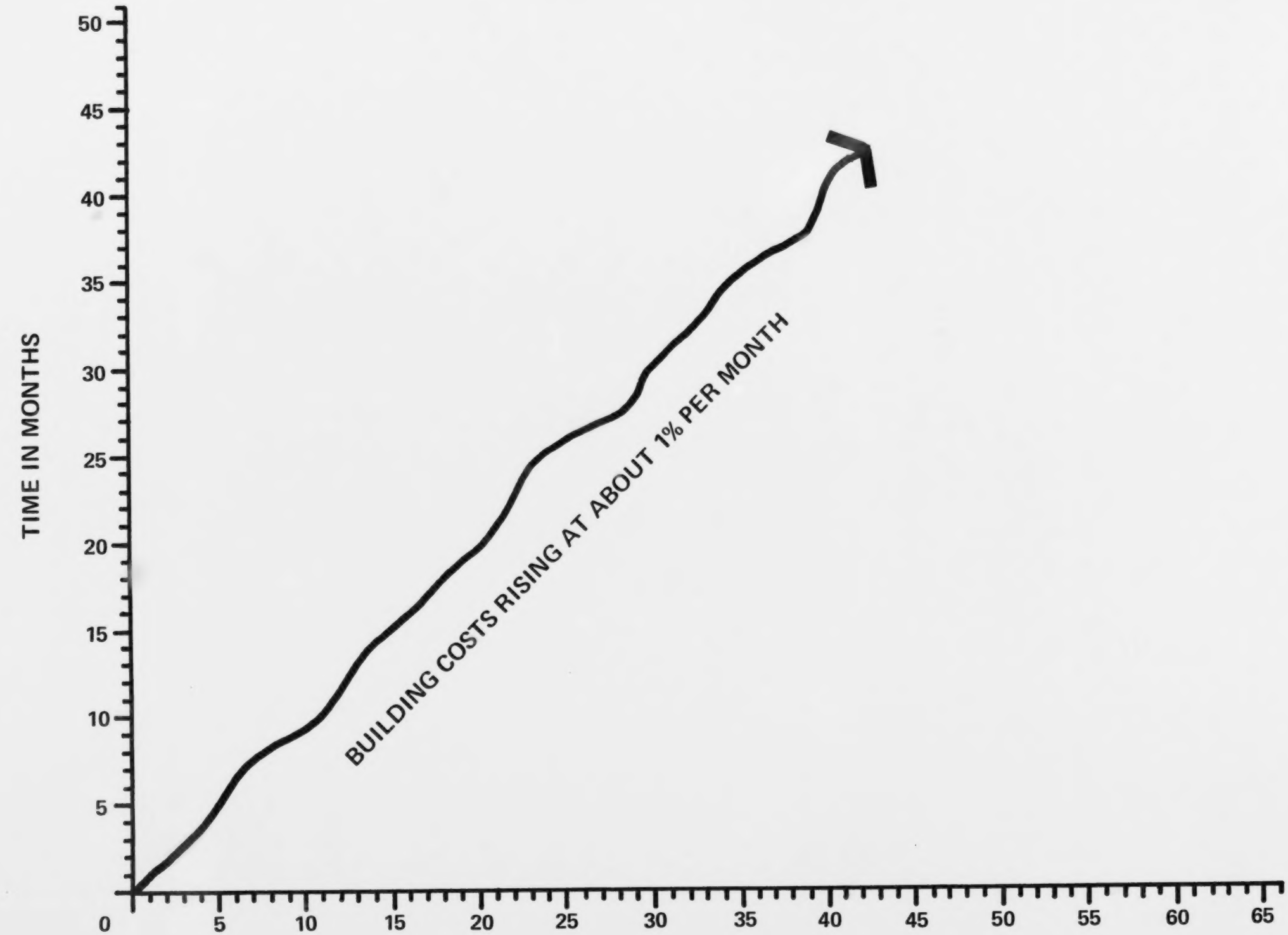
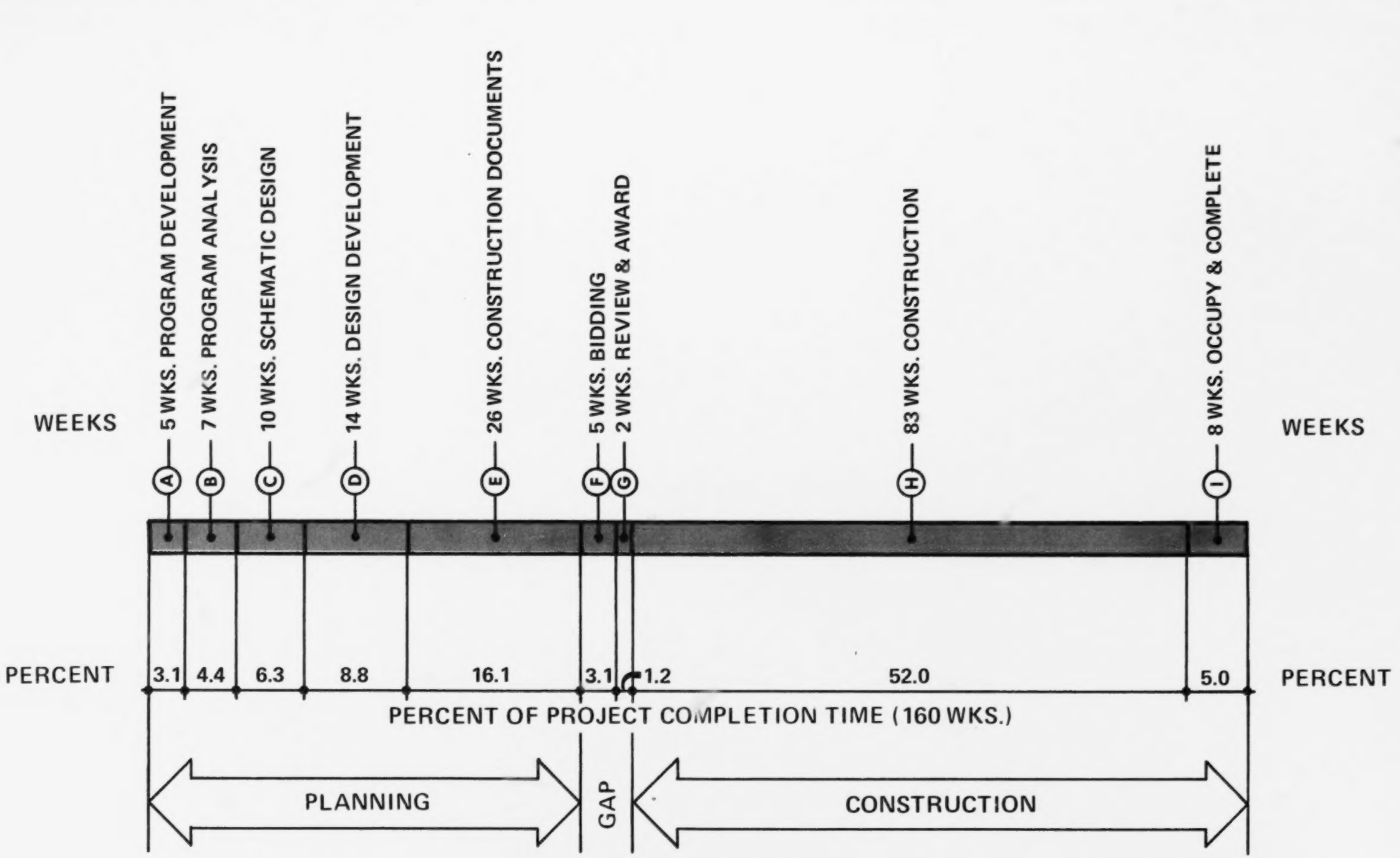
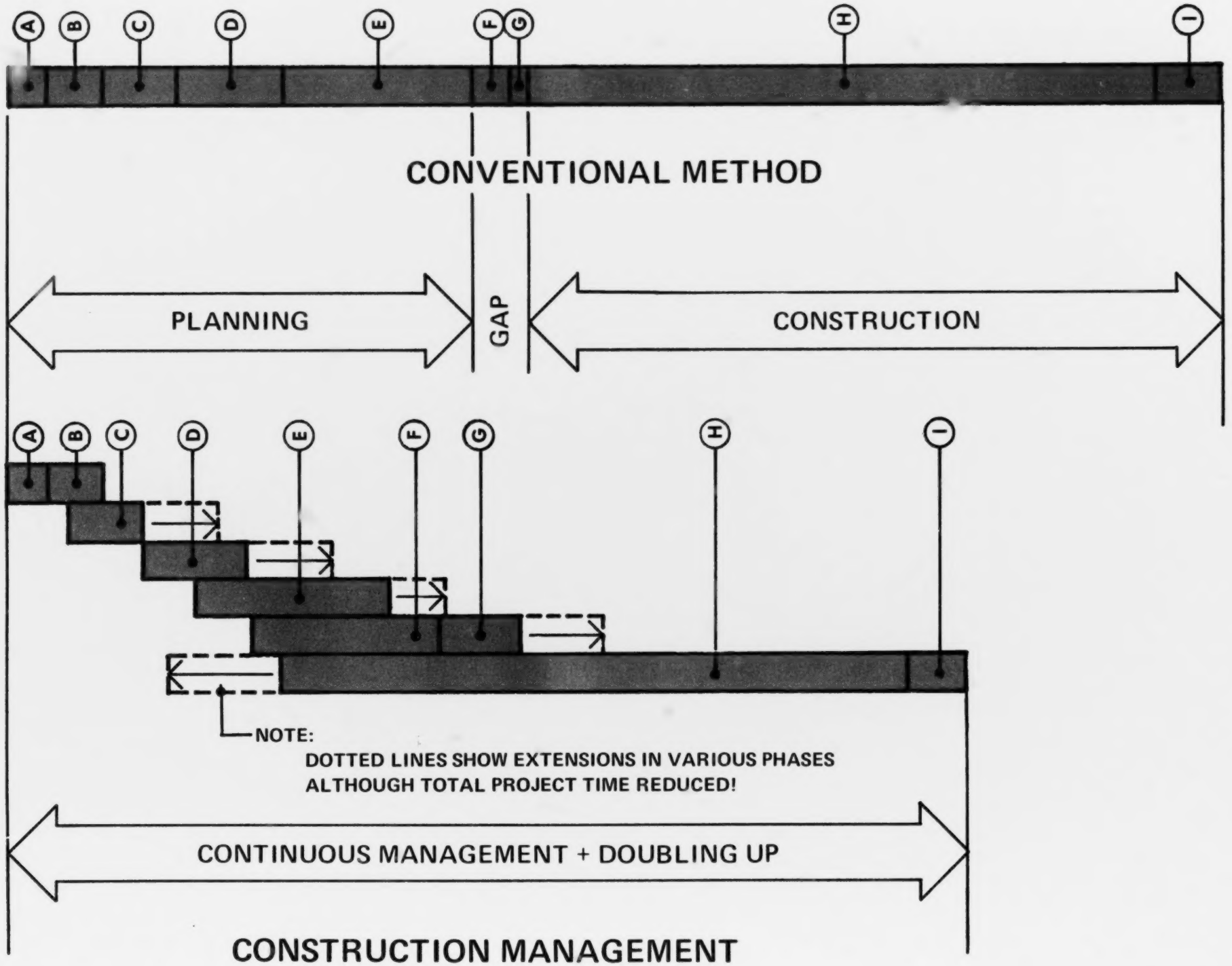


BUILDING COSTS IN AN INFLATED MARKET SITUATION

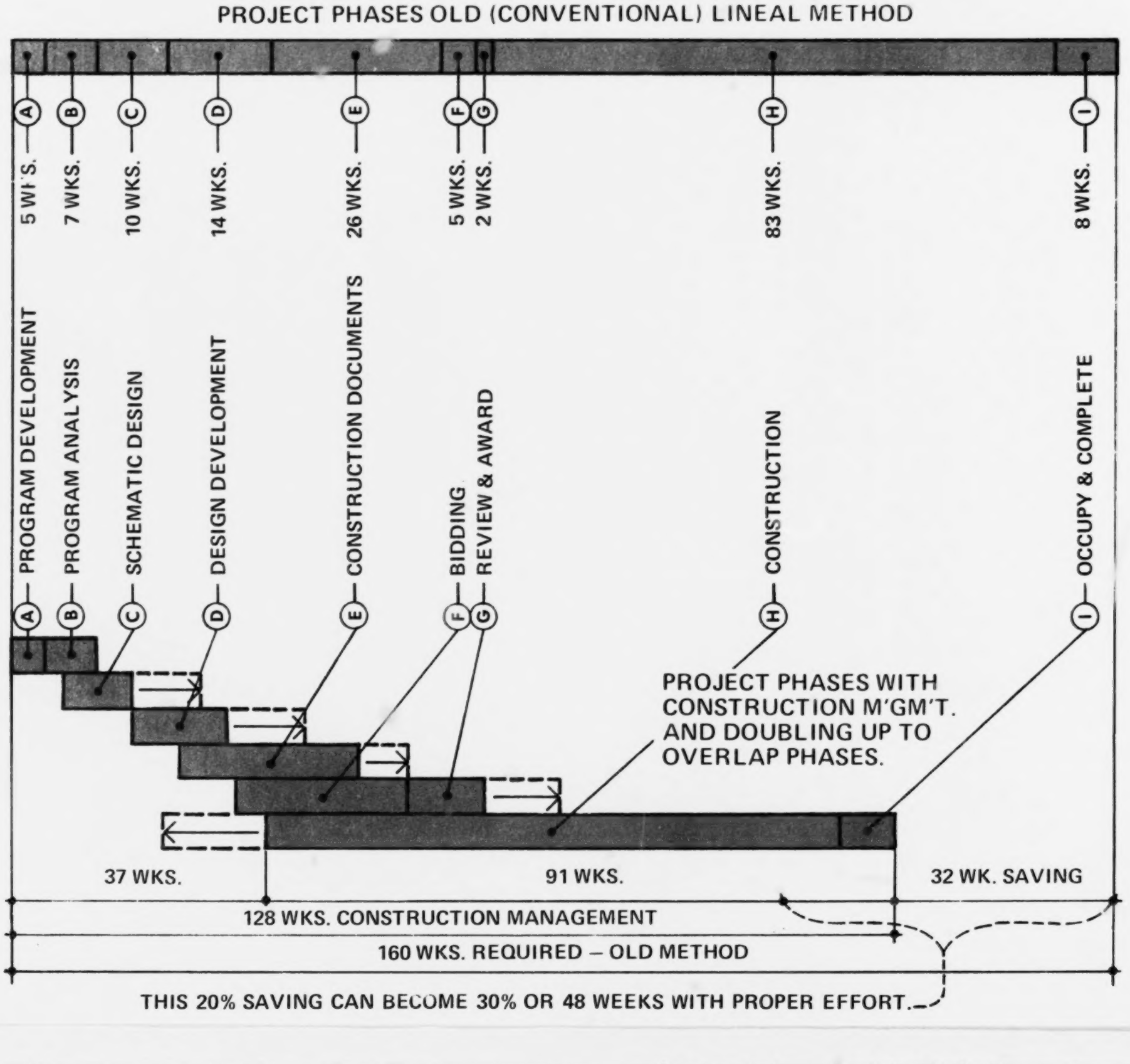


PROJECT COMPLETION SCHEDULE



CONSTRUCTION MANAGEMENT

CONVENTIONAL VERSUS ACCELERATED CONSTRUCTION SCHEDULING


PROJECT PHASES OLD (CONVENTIONAL) LINEAL METHOD
A PROGRAM DEVELOPMENT 5 WKS.
B PROGRAM ANALYSIS 7 WKS.
C SCHEMATIC DESIGN 10 WKS.
D DESIGN DEVELOPMENT 14 WKS.
E CONSTRUCTION DOCUMENTS 26 WKS.
F BIDDING 5 WKS.
G REVIEW & AWARD 2 WKS.
H CONSTRUCTION 83 WKS.
I OCCUPY & COMPLETE 8 WKS.
PROJECT PHASES WITH CONSTRUCTION M'GM'T. AND DOUBLING UP TO OVERLAP PHASES.
37 WKS.
91 WKS.
32 WK. SAVING
128 WKS. CONSTRUCTION MANAGEMENT
160 WKS. REQUIRED – OLD METHOD
THIS 20% SAVING CAN BECOME 30% OR 48 WEEKS WITH PROPER EFFORT.